Human limbal epithelial stem cell regulation, bioengineering and function.

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Public Summary:
In this review article, we highlight the advances in the diagnosis and treatment of limbal stem cell deficiency (LSCD), a disease caused by the loss or disfunction of the stem cell population in the cornea. We also discuss the recent progress in the understanding of the identification of this stem cell population as well as their regulation.

Scientific Abstract:
The corneal epithelium is continuously renewed by limbal stem/progenitor cells (LSCs), a cell population harbored in a highly regulated niche located at the limbus. Dysfunction and/or loss of LSCs and their niche cause limbal stem cell deficiency (LSCD), a disease that is marked by invasion of conjunctival epithelium into the cornea and results in failure of epithelial wound healing. Corneal opacity, pain, loss of vision, and blindness are the consequences of LSCD. Successful treatment of LSCD depends on accurate diagnosis and staging of the disease and requires restoration of functional LSCs and their niche. This review highlights the major advances in the identification of potential LSC biomarkers and components of the LSC niche, understanding of LSC regulation, methods and regulatory standards in bioengineering of LSCs, and diagnosis and staging of LSCD. Overall, this review presents key points for researchers and clinicians alike to consider in deepening the understanding of LSC biology and improving LSCD therapies.